REMARKS

Overview of the Office Action

Claims 4-7, 12, 22-25, and 30 have been rejected under 35 U.S.C. §112, first paragraph for failing to comply with the enablement requirement.

Claims 1-8, 10-12, 14-26, 28-30, and 32-39 have been rejected under 35 U.S.C. §112, second paragraph as indefinite.

Claims 1-7, 17-25, 27, 36, and 37 have been rejected under 35 U.S.C. §103(a) as rendered unpatentable by U.S. Patent No. 7,126,918 ("Roberts"), in view of U.S. Patent Appl. Pub. No. 2001/0023453 ("Sundqvist").

Claims 10-12, 14, 16, 28-30, 32, and 34 have been rejected under 35 U.S.C. §103(a) as unpatentable over Roberts and Sundqvist, and further in view of U.S. Patent Pub. No. 2004/0151197 ("Hui").

Claims 15 and 33 have been rejected under 35 U.S.C. §103(a) as unpatentable over Roberts and Sundqvist in view of Hui, and further in view of U.S. Patent Pub. No. 2003/0014180 ("Myr").

Claim 35 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Roberts and Sundqvist and further in view of U.S. Patent No. 6,643,256 ("Shimojo").

Claims 8 and 26 have been found to contain allowable subject matter, and would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 38 and 39 have been allowed.

Status of the claims

Claims 1, 7, 12, 19, and 30 have been amended.

Claims 9, 13, 27, and 31 have previously been canceled.

Claims 38-39 have been allowed.

Claims 1-8, 10-12, 14-26, 28-30, and 32-39 remain pending.

Rejection of claims 4-7, 12, 22-25, and 30 under 35 U.S.C. §112, first paragraph

The Office Action states that the claims have been rejected for failing to comply with the enablement requirement. Specifically, the Office Action states the specification fails to describe a "list of active flows" as recited in Applicants' claims. Applicants disagree.

Applicants' specification clearly and explicitly describes a list of active flows and a separate list of protected flows. The list of active flows is referred to in Applicants' specification as a "flow_list", and is described in paragraphs [0132], [0141], [0160], [0161], and [0162] of Applicants' specification. Specifically, the list of active flows is used by the scheduling algorithm for assigning priority to packets of flows in the queue.

The list of protected flows is described in paragraphs [0094], [0097], and [0109] of Applicants' specification. The list of protected flows 30 is used when admission control is performed by a routing module before the scheduling of packets of flows. Further, in one embodiment of Applicants' invention, the admission control module may be absent, which results in the flows being directly presented to the routing module for scheduling (see paragraphs [0062] and [0104] of Applicants' specification).

Therefore, the specification does, in fact, describe a list of active flows, which is used for scheduling as priority or non-priority packets of flows depending on whether they are identified

on the list, and a list of protected flows, which is used before scheduling for determining admitted flows when admission control is performed.

The Office Action also states that the recitation of "a list of active flows" in claims 12 and 30 has an incorrect antecedent basis. Claims 12 and 30 have been amended to replace the limitation "a list of active flows" with the limitation "the list of active flows".

Claim 7 has also been amended to clarify that "the list" is "the list of protected flows" as recited in claim 4, from which claim 7 depends.

Applicants submit that this rejection has been fully overcome.

Rejection of claims 1-8, 10-12, 14-26, 28-30, and 32-39 under 35 U.S.C. §112, second paragraph

The Office Action states that the claims have been rejected as indefinite because they allegedly do not adequately differentiate between the differently claimed priorities.

According to Applicants' recited invention, there is only one way for assigning a priority to a packet of flows. Any packets of flows that are not identified in the list of active flows are scheduled as priority packets, while any packets of flows that are already identified in the list of active flows are scheduled as non-priority packets, as recited in Applicants' claim 1.

A flow is written in the list of active flows (if not already there) when a packet from that flow is received (i.e., when a packet arrives at the routing module) by the routing module. This flow is erased from the list of active flows if the routing module has not received any packets (from that flow) after a certain time period.

Applicants' recited mechanism of writing and erasing flows in the list of active flows enables priority to be assigned to the packets of the flows for which a bit rate is below a dynamic threshold, which is determined by traffic conditions. In other words, priority is assigned to the

arriving packets when the flow is not "active" in the sense that the flow is not listed in the list of active flows. As indicated above, a flow is erased from the list of active flows if the routing module has not received any packets after a certain time period, which means that the bite rate of the flow is below a dynamic threshold. The length of this time period is determined by traffic conditions.

According to Applicants' invention, the flow_list is updated by adding the identifier of the new flow with a flow_time_stamp equal to a virtual-time plus the length L of the packet (see paragraphs [0161]-[0167] and Fig. 6 of Applicants' specification). If the virtual time becomes greater than the flow_time_stamp, then the flow is erased from the list of active flows. In this particular situation (see step 162 of Fig. 6 of Applicants' specification), the bit rate of the flow is below a dynamic threshold, which is determined by traffic conditions. Additionally, the virtual time exceeding the flow_time_stamp also implies that the flow has been inactive for a certain period of time. In other words, the "virtual_time" value enables priority to be assigned to the packets of flows that have a bit rate that is below a dynamic threshold.

Claims 1 and 19 have now been amended to clarify that these claims recite only one way for assigning a priority to a packet of flows. No new matter has been introduced.

Applicants submit that this rejection has been overcome.

Rejection of claims 1-7, 9, 17-25, 27, 36, and 37 under 35 U.S.C. §103(a)

The Office Action states that the combination of Roberts and Sundqvist teaches all of Applicants' recited elements.

Independent apparatus claim 1 recites a device for processing packets of flows on a network link that includes "scheduling means for scheduling packets of flows in a queue in

accordance with a fair queuing with priority algorithm, the scheduling means being configured to schedule as priority packets any packets of flows in the queue that are not identified in a list of active flows and as non-priority packets any packets of flows that are already identified in the list of active flows; and means for writing flows in and erasing flows from the list of active flows as a function of the arrival and departure of packets of the flows, said means being configured to erase from the list of active flows a flow which has not had any packets in the queue for a certain time period, and thereby assigning a priority to the packets of the flows for which a bit rate is below a dynamic threshold, the dynamic threshold being determined by traffic conditions".

Thus, according to Applicants' claim 1 recited invention, the suppression of a non-active flow (i.e. a flow with a bit rate that remains below the dynamic threshold ("fair bit rate")) from the list of active flows ensures that the next packet of this deleted flow will be handled with priority. More particularly, only the very next packet of this deleted flow will be handled with priority; after this next packet has been handled, the deleted flow is again made active (i.e., included in the list of active flows). A low rate flow will be removed from the list of active flows again before the next packet arrives (see paragraph [0134] of Applicants' specification).

Roberts and Sundqvist, whether taken alone or in combination, fail to teach or suggest "the scheduling means being configured to schedule as priority packets any packets of flows in the queue that are not identified in a list of active flows and as non-priority packets any packets of flows that are already identified in the list of active flows", and "means for writing flows in and erasing flows from the list of active flows as a function of the arrival and departure of packets of the flows, said means being configured to erase from the list of active flows a flow which has not had any packets in the queue for a certain time period, and thereby assigning a priority to the packets of the flows for which a bit rate is below a dynamic threshold, the

dynamic threshold being determined by traffic conditions", as recited in Applicants' independent claim 1.

The Examiner concedes that Roberts fails to teach or suggest "the scheduling means being configured to schedule as priority packets any packets of flows in the queue that are not identified in a list of active flows and as non-priority packets any packets of flows that are already identified in the list of active flows", as recited in Applicants' claim 1.

The Examiner, however, cites col. 8, lines 28-32, and col. 9, lines 63-65 of Roberts and asserts that Roberts' disclosure of a micro-flow timeout period in which a micro-flow is terminated if a packet belonging to the flow is not received after a certain period of time anticipates Applicants' recited means for writing flows in and erasing flows from the list of active flows as a function of the arrival and departure of packets of the flows, said means being configured to erase from the list of active flows a flow which has not had any packets in the queue for a certain time period, and thereby assigning a priority to the packets of the flows for which a bit rate is below a dynamic threshold, the dynamic threshold being determined by traffic conditions. Applicants disagree.

Roberts discloses a method of microflow management. According to Roberts, network 200 relies upon per flow state information including QoS and routing information that allows the network 200 to route IP data packets within specific QoS constraints over the network 200 for a specific group of data packets (e.g., micro-flow A) between a source (e.g., computer system 110A) and a destination (e.g., computer system 110F).

In particular, based upon the per flow state-based QoS information, the network 200 of Roberts is purportedly able to attain efficient signaling (routing) and queuing for each micro-flow, thereby ensuring that certain QoS guarantees, such as guaranteed rate ("GR") and

guaranteed maximum delay variation ("DV") can be maintained. Such QoS guarantees are possible because each switch 220 in the network 200 of Roberts can monitor available bandwidth on the trunks coupled to each switch 220 and thereby manage each micro-flow on an individual basis to ensure that each micro-flow is routed in a manner that ensures that the desired QoS constraints are satisfied (see col. 6, line 54 to col. 7 line 4 of Roberts).

Roberts discloses a flow block table 570 that includes a plurality of flow blocks, each of which include state-based QoS descriptors corresponding to a unique micro-flow. Roberts further discloses determining whether a flow block already exists for a received packet by searching the flow block table 570 (see col. 12, line 64 - col. 13, line 2 of Roberts). Packets not belonging to an existing flow in the flow block table 570 of Roberts are scheduled by constructing a new flow block in flow block table 570 (see col. 13, lines 3-16 of Roberts).

Although the content of the flow block table 570 of Roberts can be dynamically adjusted, the flow block table 570 disclosed by Roberts is not equivalent to the list of active flows recited in Applicants' amended claim 1.

Specifically, the level of priority at which the micro-flows of Roberts are handled depends directly on the QoS descriptors and path information retrieved from the corresponding flow block (see col. 13, lines 1-11 of Roberts). The priority at which the micro-flows of Roberts are handled does not depend on whether the flow is identified in the flow block table 570.

Roberts teaches that a micro-flow can be added to the flow block table 570 (see col. 13, lines 13-15 of Roberts). However, Roberts does not teach or suggest that the added micro-flow is an active flow whose packets should be considered as non-priority packets for scheduling purposes. Instead, the flow block table 570 of Roberts lists all micro-flows that should be taken into account for the scheduling operation, regardless of whether the packets of the flows are

considered as priority or non-priority packets (see col. 12, lines 64-67 and col. 13, lines 3-11of Roberts). Thus, the fact that a micro-flow is identified in the flow block table 570 of Roberts is not a criterion for deciding whether or not the packets of the micro-flow should be handled with priority. Therefore, the flow block table 570 of Roberts cannot in any way be considered as analogous to Applicants' recited active flow list.

Roberts further teaches that a flow can be deleted from the flow block table 570 and therefore terminated after a certain period of time (according to the micro-flow timeout period DT) (see col. 8, lines 28-30 and col. 9, line 63-col. 10, line 13 of Roberts). The termination of the flow of Roberts means that the flow is no longer included in the scheduling process. Consequently, in order to be able to process any subsequent packet from that terminated flow, the system of Roberts requires either a new signaling procedure or a determination from the content of the packet of the terminated flow of a QoS profile to be applied (see col. 13, line 12 - col. 14, line 13 of Roberts).

In contrast to Roberts, the invention recited in Applicants' claim 1 includes removing from the list of active flows any flow that is not active (i.e. a flow with a bit rate that is below the dynamic threshold) to ensure that the next packet of that flow will be handled with priority, without however terminating the flow. In other words, according to Applicants' invention, the removal of a flow from the list of active flows only involves removing a reference to the flow from the active flow list and does not result in the flow itself being terminated, but instead results in the packets of the flow being temporarily assigned a higher priority since the corresponding bit rate is below the dynamic threshold.

Thus, by dynamically removing a flow from the list of active flows, Applicants' recited invention enables dynamic management of QoS of that flow, given that certain parts of the flow

can be handled with priority for a certain time period (i.e. whenever the bit rate of this flow is below the dynamic threshold), without however terminating the flow. The flow remains in the list of active flows and if, at a later time, the bit rate of this flow exceeds the dynamic threshold, the packets of the flow will then be considered as non-priority packets (i.e., a lower priority).

In response to Applicants' previous arguments, the Examiner asserts that the features relied upon (i.e., erasing a flow from the active flow list without terminating the flow) are not recited in the claims.

Applicants' previous arguments were merely intended to demonstrate that the flow block table 570 of Roberts is completely different in function and utility and operation from, and thus cannot and does not correspond to, and furthermore does not properly anticipate, Applicants' recited list of active flows.

Further, and as described above, when a flow is erased from Applicants' active flow list, it is because that flow has a bit rate that is below the dynamic threshold, and consequently the next packet of that flow will be handled with priority. It is thus inherent that the flow is not terminated.

Because the flow block table 570 disclosed by Roberts is a list of all micro-flows that should be taken into account for the scheduling operation, regardless of whether the packets of the flows are considered as priority or non-priority packets, the flow block table 570 is not an active flow list as recited in Applicants' claim 1. Therefore, Roberts quite clearly fails to teach or suggest an active flow list as recited in Applicants' claim 1.

Moreover, because Roberts fails to teach or suggest any type of active flow list, Roberts necessarily fails to teach or suggest "means for writing flows in and erasing flows from the list of active flows as a function of the arrival and departure of packets of the flows", as recited in

Applicants' claim 1.

Additionally, because Roberts fails to teach an active flow list, and because a flow (either priority or non-priority) is terminated from the flow block table 570 for the purpose of being removed (terminated) from the scheduling process, rather than merely being removed from a list for the purpose of being specifically assigned a predetermined priority, as recited in Applicants' claim 1, Roberts also necessarily fails to teach or suggest "said means being configured to erase from the list of active flows a flow which has not had any packets in the queue for a certain time period, and thereby assigning a priority to the packets of the flows for which a bit rate is below a dynamic threshold, the dynamic threshold being determined by traffic conditions", as recited in Applicants' claim 1.

For the reasons presented above, Roberts fails to teach or suggest "means for writing flows in and erasing flows from the list of active flows as a function of the arrival and departure of packets of the flows, said means being configured to erase from the list of active flows a flow which has not had any packets in the queue for a certain time period, and thereby assigning a priority to the packets of the flows for which a bit rate is below a dynamic threshold, the dynamic threshold being determined by traffic conditions", as recited in Applicants' independent claim 1.

The Examiner cites of paragraphs [0050]-[0052] of Sundqvist as allegedly teaching Applicants' recited "scheduling means being configured to schedule as priority packets any packets of flows in the queue that are not identified in a list of active flows and as non-priority packets any packets of flows that are already identified in the list of active flows". Applicants disagree.

Sundqvist discloses a method and system for providing a user of a terminal the ability to control the available bandwidth of application data flows in and out of the terminal in accordance with the user's preference. The scheduling of application flows (assigning priority) is performed by limiting the available bandwidth, for the flows of applications, which are not privileged by the user (see Abstract of Sundqvist).

Sundqvist fails to address the scheduling of packets and therefore fails to address the packet delay of the queue. The notion of priority that Sundqvist is concerned with relates only to the amount of bandwidth attributed to the flows and not to packet delays.

According to Sundqvist, outgoing data flows are controlled by supervising the sending times of data packets on the different outgoing application flows. The processing of Sundqvist is carried out on the flows of applications and is not executed packet by packet as in Applicants' recited invention.

The means in Sundqvist for controlling the assignment of the available bandwidth to the application flows in accordance with the user's preference is significantly different from the list of active flows recited in Applicants' claim 1. Specifically, in the system of Sundqvist, a user assigns the bandwidth (priority or restriction) allotted to each application flow (see paragraph [0050] of Sundqvist). Sundqvist fails to teach or suggest any notion of a list of active flows. With the system of Sundqvist, the assignment of a greater or lesser part of the bandwidth (priority and non-priority) to an application flow is not in any way carried out in accordance with the absence or the presence of the application flow in a specific list.

In view of the above, Sundqvist cannot be relied upon as teaching the use of a list of active flows for scheduling as priority packets the packets of flows not identified in a list of active flows (that does not exist), and as non-priority packets the packets already identified in the

list of active flows.

Furthermore, the cited passages of Sundqvist simply teach that a new application flow is given some type of default bandwidth, such as a bandwidth equal to an application flow with the highest bandwidth, or a bandwidth equal to an application flow with the lowest bandwidth, for example. Sundqvist also teaches that the user can be forced to set the default bandwidth.

Nothing in the cited passages of Sundqvist teach or suggest anything regarding assigning a priority bandwidth to an application flow that is not identified in a list of active application flows or assigning a non-priority bandwidth to an application flow already identified in a list of active application flows. Sundqvist mentions nothing whatsoever regarding an active flow list.

Therefore, Sundqvist clearly fails to teach or suggest "the scheduling means being configured to schedule as priority packets any packets of flows in the queue that are not identified in a list of active flows and as non-priority packets any packets of flows that are already identified in the list of active flows", as recited in Applicants' independent claim 1.

Furthermore, Sundqvist fails to teach anything whatsoever regarding a "means for writing flows in and erasing flows from the list of active flows as a function of the arrival and departure of packets of the flows, said means being configured to erase from the list of active flows a flow which has not had any packets in the queue for a certain time period, and thereby assigning a priority to the packets of the flows for which a bit rate is below a dynamic threshold, the dynamic threshold being determined by traffic conditions", as recited in Applicants' independent claim 1.

Therefore, Sundqvist fails to teach or suggest the elements recited Applicants' claim 1 that Roberts is missing. Consequently, the combination of Roberts and Sundqvist fails to teach or suggest Applicants' recited invention.

Independent method claim 19 recites limitations similar to those now present in claim 1 and is, therefore, also deemed to be patentable over Roberts for the reasons discussed above with respect to claim 1.

In view of the foregoing, Applicants submit that Roberts and Sundqvist, whether taken alone or in combination, fail to teach or suggest the subject matter recited in amended independent claims 1 and 19. Accordingly, claims 1 and 19 are patentable over Roberts and Sundqvist under 35 U.S.C. §103(a).

Dependent claims

Claims 2-7, 17-18, 20-25, 27, 36, and 37, which depend from independent claims 1 and 19, incorporate all of the limitations of the respective independent claim and are, therefore, deemed to be patentably distinct over Roberts and Sundqvist for at least those reasons discussed above with respect to independent claims 1 and 19.

Rejection of claims 10-12, 14, 16, 28-30, 32, and 34 under 35 U.S.C. §103(a)

The Office Action states that the combination of Roberts, Sundqvist, and Hui teaches all of Applicants' recited elements.

Roberts and Sundqvist have been previously discussed and fail to teach or suggest the invention recited in Applicants' independent claims 1 and 19.

Because Roberts and Sundqvist fail to teach or suggest the subject matter recited in Applicants' amended independent claims 1 and 19, and because Hui fails to teach or suggest any elements of independent claims 1 and 19 that Roberts and Sundqvist are missing, the addition of Hui fails to remedy the above-described deficiencies of Roberts and Sundqvist.

Claims 10-12, 14, 16, 28-30, 32, and 34, which depend from amended independent claims 1 and 19, incorporate all of the limitations of the respective independent claim and are, therefore, deemed to be patentably distinct over the combination of Roberts, Sundqvist, and Hui for at least those reasons discussed above with respect to independent claims 1 and 19.

Rejection of claims 15 and 33 under 35 U.S.C. §103(a)

The Office Action states that the combination of Roberts, Sundqvist, Hui, and Myr teaches all of the elements recited in these claims.

Roberts and Sundqvist have been previously discussed and fail to teach or suggest the invention recited in Applicants' independent claims 1 and 19.

Because Roberts and Sundqvist fail to teach or suggest the subject matter recited in Applicants' amended independent claims 1 and 19, and because Hui and Myr fail to teach or suggest any elements of independent claims 1 and 19 that Roberts and Sundqvist are missing, the addition of Hui and Myr fails to remedy the above-described deficiencies of Roberts and Sundqvist.

Claims 15 and 33, which depend from amended independent claims 1 and 19, incorporate all of the limitations of the respective independent claim and are, therefore, correspondingly deemed to be patentably distinct over the combination of Roberts, Sundqvist, Hui, and Myr for at least those reasons discussed above with respect to independent claims 1 and 19.

Rejection of claim 35 under 35 U.S.C. §103(a)

The Office Action states that the combination of Roberts, Sundqvist, and Shimojo teaches all of the elements recited in Applicants' claim 35.

Roberts and Sundqvist have been previously discussed and fail to teach or suggest the invention recited in Applicants' independent claim 19.

Because Roberts and Sundqvist fail to teach or suggest the subject matter recited in Applicants' amended independent claim 19, and because Shimojo fails to teach or suggest any elements of independent claim 19 that Roberts and Sundqvist are missing, the addition of Shimojo fails to remedy the above-described deficiencies of Roberts and Sundqvist.

Claim 35, which depends from amended independent claim 19, incorporates all of the limitations of independent claim 19 and is, therefore, deemed to be patentably distinct over the combination of Roberts, Sundqvist, and Shimojo for at least those reasons discussed above with respect to independent claim 19.

Conclusion

In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of all rejections, and allowance of all pending claims, in due course.

Should the Examiner have any comments, questions, suggestions, or objections, the Examiner is respectfully requested to telephone the undersigned to facilitate an early resolution of any outstanding issues.

It is believed that no additional fees or charges are required at this time in connection with the present application. However, if any fees or charges are required at this time in connection with the present application, it may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,
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